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REALTRAIN VALIDATION FOR RIFLE SQUADS II: TACTICAL PERFORMANCE DURING MOVEMENT-TO-CONTACT

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A field experiment was carried out to determine the relative effectiveness of REALTRAIN, an engagement simulation training system, and conventional training. Rifle squads were given a tactical pretraining test, 3 days of training using either REALTRAIN or conventional methods, a posttraining test, and finally a series of tactical exercises in which REALTRAIN and conventional squads opposed one another. Performance during the movement-to-contact was shown to be highly correlated with subsequent performance during

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the attack. Consistent with earlier findings on tactical performance during contact and on mission accomplishment and casualty exchange, REALTRAIN was shown to be more effective than conventional field training in the training of infantry rifle squads.

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REALTRAIN VALIDATION FOR RIFLE SQUADS III: TACTICAL PERFORMANCE DURING MOVEMENT-TO-CONTACT

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Tactical Team Performance

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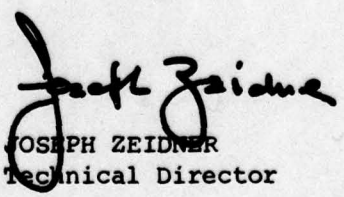
FOREWORD

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has developed a broad program for more effective training of combat units in the Army. The U.S. Army Training and Doctrine Command (TRADOC) has identified small-unit tactical engagement simulation training as one of its highest behavioral sciences research priorities. One product of this research program is a tactical engagement simulation training method known as REALTRAIN that provides extremely realistic and motivating training for small combat arms units. The method is described in ARI Technical Report S-4 and ARI Research Report 1191.

To validate REALTRAIN, ARI conducted a series of field tests supported by personnel of the ARI Presidio of Monterey Field Unit, Jack J. Sternberg, chief. This report, one of a series, presents part of the findings of an experiment conducted at Fort Ord, Calif., in May 1977. The ARI core team that planned and executed the validation test, in addition to the authors, were LTC Thomas J. Ritenour, Lawrence L. Meliza, and Gary Kress of the ARI Field Unit, Presidio of Monterey; F. H. Steinheiser, Jr., Kenneth Epstein, and MAJ (P) Shelton E. Wood of the Engagement Simulation Technical Area; and LTC Larry Word, TRADOC System Manager for Tactical Engagement Simulation (TSM-TES).

LTC Thomas J. Ritenour of the ARI Field Unit, Presidio of Monterey, helped organize and supervise the military support aspects of the field tests. This research could not have been accomplished without the support of the 7th Infantry Division. Special thanks are due to CPT Douglas L. Hawkins, 3/32 Infantry, and CPT (P) Donald Loftis, Office TSM-TES.

This research was conducted within the December 1976 Five-Year Test Program (FYTP) as approved by the Army Test Schedule and Review Committee (TSARC). The entire program is responsive to the requirements of Army Projects 2Q763743A773 and 2Q763743A780 and the TRADOC System Manager for Tactical Engagement Simulation (TSM-TES) of the U.S. Army Training Support Center, Fort Eustis, Va. The research reported here was conducted as part of Army Project 2Q763743A775.



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REALTRAIN VALIDATION FOR RIFLE SQUADS III: TACTICAL PERFORMANCE DURING MOVEMENT-TO-CONTACT

BRIEF

Requirement:

To compare and evaluate the tactical performance of rifle squads trained with REALTRAIN engagement simulation methods and rifle squads trained by conventional combat field training methods during movement-to-contact; to relate these performances to the successful execution of the squad's mission; and to develop measures and procedures that will improve the diagnostic capabilities of Army Training and Evaluation Programs (ARTEPs).

Procedure:

In Phase I, 18 rifle squads of nine men each from the 7th Infantry Division at Fort Ord, Calif., engaged in a pretest field exercise to establish pretraining performance levels. This pretest included a movement-to-contact and attack against a four-man outpost and a hasty defense against a skilled squad-size opposition force.

Phase II provided 3 days of carefully coordinated training using REALTRAIN methods for nine squads and using conventional methods for nine squads.

Phase III--the posttest--repeated the pretest on different terrain to establish performance improvement after training.

In Phase IV, each squad conducted two attacks and two defenses against squads of the other training group (shootoff exercise).

Findings:

Results were assessed in terms of tactical performances during the movement-to-contact phase of a movement-to-contact/attack mission.

All squads performed at similar levels during pretraining tests. In posttraining tests, conventionally trained squads showed improvement over pretraining test performances on only the most basic of the skills measured. In contrast, REALTRAIN-trained squads showed large improvements not only on discrete skills, but also on the application and integration of these skills into coordinated movement, support, observation, and communication/control functions. Moreover, performance in these functional areas was highly correlated with subsequent performance during the attack.

Utilization of Findings:

Results from this portion of the field assessment of REALTRAIN provide empirical evidence of the greater effectiveness of tactical training incorporating engagement simulation over conventional combat unit training. The Army is now using REALTRAIN methods for squad and platoon training and evaluation, and new engagement simulation methods are being developed for larger units. These methods will allow highly realistic training to be conducted. In addition, performance measures and evaluation procedures used in this field test will, when incorporated into operational ARTEPs, greatly improve training effectiveness and economy by permitting better measurement of training performance and better diagnosis of training needs.

REALTRAIN VALIDATION FOR RIFLE SQUADS III: TACTICAL PERFORMANCE DURING MOVEMENT-TO-CONTACT

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REALTRAIN VALIDATION FOR RIFLE SQUADS III: TACTICAL PERFORMANCE DURING MOVEMENT-TO-CONTACT

INTRODUCTION

The improvement of tactical training is one of the Army's highest priorities. In recent years, the Army has sought to increase the effectiveness of unit training through the introduction of the Army Training and Evaluation Program (ARTEP). The ARTEP has placed increased emphasis on development of performance-oriented training and evaluation methods.

The current ARTEP stresses that unit proficiency should be judged on the basis of performance of appropriate missions carried out with as much tactical realism as possible. Further, the ARTEP attempts to set forth training objectives and standards in explicit performance terms. As initially implemented, the ARTEP had some critical weaknesses. One weakness was that there was no way to objectively determine terminal mission outcomes. This problem is largely being overcome with the introduction of tactical engagement simulation training methods such as SCOPES, REALTRAIN, and eventually the Multiple Integrated Laser Engagement System (MILES). With these methods, commanders can conduct two-sided, free-play tactical exercises with credible casualty assessment and weapons signature effects with a high degree of realism.

A second major weakness of ARTEPs is a general superficiality that results in inadequate guidance for Army trainers. For example, evaluation of the movement-to-contact phase of the rifle squad movement-to-contact/meeting engagement (ARTEP 7-15) specifies only that "Squad uses traveling technique when contact is not likely, traveling overwatch when contact is possible, and bounding overwatch when contact is expected. The squad's execution of these movement techniques uses terrain to minimize its exposure and maximize its ability to deliver suppressive fires from the best available overwatch positions." Clearly, if a unit fails to accomplish its mission, this general guidance does not help the trainer determine reasons for failure. In further ARTEP development, trainers should receive better guidance in diagnosing specific training needs at <u>all</u> phases of the missions, so that they can design an economical, effective, and efficient training program.

ARI and TRADOC are conducting a research program to improve Army tactical training and evaluation. This program includes the development of tactical engagement simulation training methods such as REALTRAIN and MILES and will provide a basis for improving existing ARTEPs. The use of improved ARTEPs and the employment of advanced engagement simulation tactical training methods can greatly improve readiness of combat units. Not only will trainers be able to determine objectively the terminal mission outcomes (e.g., mission accomplishment and casualty

exchange ratios), but trainees also receive help in determining proficiency on critical intermediate tasks. Consistent with the performance-oriented, criterion-referenced approach, a critical intermediate task is defined as one that can be shown to substantially increase the probability of mission accomplishment. The steps to identify these tasks are as follows:

- Identification of candidate intermediate tasks;
- Development of objective measures of proficiency for these tasks;
- Determination of the conditions necessary to gather these data reliably;
- Correlation of intermediate task proficiency with mission outcomes; and
- Identification of tasks that correlate most highly with mission outcomes.

The payoff from this research should be not only the empirical identification and validation of critical intermediate tasks, but also the determination of objective measures of task proficiency and measurement procedures that can be incorporated into the ARTEP.

Two field experiments (one with rifle squads and one with armor/anti-armor teams) were conducted in which the training effectiveness of REALTRAIN was compared with the effectiveness of conventional training methods not using engagement simulation. The tactical tests used to compare the training methods were based on current ARTEPs, but they have been greatly expanded to permit detailed analysis of tactical performance. This paper, one of a series of reports[1] based on these experiments, examines a variety of measures of tactical performance for rifle squads in the movement-to-contact phase of a movement-to-contact meeting engagement mission.

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[1] Banks, J. H., Hardy, G. D., Jr., Scott, T. D., Kress, G., & Word, L. REALTRAIN Validation for Rifle Squads: Mission Accomplishment. ARI Research Report 1192, October 1977.

Scott, T. D., Meliza, L. L., Hardy, G. D., Jr., Banks, J. H., & Word, L. REALTRAIN Validation for Armor/Anti-Armor Teams. ARI Research Report 1204, March 1979.

Meliza, L. L., Scott, T. D., & Epstein, K. I. REALTRAIN Validation for Rifle Squads II: Tactical Performance. ARI Research Report 1203, March 1979.

Scott, T. D., Meliza, L. L., Hardy, G. D., Jr., & Banks, J. H. Armor/Anti-Armor Team Tactical Performance. ARI Research Report 1218, July 1979.

METHOD

The field experiment consisted of four phases of tactical training and performance testing. Players were 18 nine-man squads from the 7th Infantry Division at Fort Ord, Calif. The experiment was conducted in four phases. Phase I was a tactically realistic pretraining test administered to establish entry-level tactical proficiency and to establish the equivalence of squads to be trained. Phase II consisted of a 3-day training period during which squads received either REALTRAIN or conventional training. Phase III was a posttraining test, conducted to determine the performance increments resulting from training. Phase IV consisted of two-sided, free-play engagements in which REALTRAIN and conventionally trained squads opposed one another in an attack on a prepared defensive position.

Pretraining and posttraining tests (Phases I and III) consisted of a movement-to-contact/hasty attack followed by a hasty defense. This report examines the data collected during the movement-to-contact/hasty attack mission. The scenario for these tests was based on guidance provided in ARTEP 7-15, but it was greatly augmented to encompass the large number of performance measures required for detailed performance analysis.

The test scenario of interest included occupation of an assembly area, movement-to-contact, reaction-to-contact, and attack. Two test lanes were selected so that terrain was as similar as possible and so that tactical realism was maintained. Each squad was administered the pretraining test on one lane and the posttraining test on the other. In addition, order of lane use in pretests and posttests was counterbalanced to minimize possible lane effects.

Participants in the exercise could use M16A1 rifles, M60 machineguns, practice hand grenades, smoke hand grenades, and practice claymore mines. No mortar or artillery was played. Tested squads were given a movement-to-contact mission in which they encountered and subsequently attacked an enemy observation post (OP).

The OP consisted of an M60 machinegun team and two riflemen in well-prepared, dug-in positions. Thus, the force ratio in this attack was approximately 2:1. The terrain in front of the OP was relatively open, which provided excellent fields of fire and a decided advantage to the defending opposition force (OPFOR).

The OPFOR was given several days of collective training using REALTRAIN prior to the test to bring the force to a high level of tactical proficiency. The OPFOR also received experiment-specific training to insure that their defenses during the pretraining and posttraining tests presented a standardized threat. The test conditions presented extremely difficult objectives for the tested squads.

RESULTS

The performances of squads trained by REALTRAIN and by conventional methods were similar during pretests. Following training, both groups demonstrated improved performance on formation and movement techniques in the following areas:

- Use of overwatch during movement.
- Position assumed by the squad leader during movement.
- Use of terrain and vegetation for cover/concealment during movement.
- Establishment of overwatch positions for negotiating a danger area.
- Use of smoke grenades to mask deployment upon receiving fire.
- Adjustment of movement rate to imminence of contact.

In addition, after training, REALTRAIN squads performed far better than conventional squads in the movement-to-contact because they

- Maintained greater depth in their formations.
- Positioned the point out farther in front of the squad main body.
- Provided better coverage for the point.
- Maintained greater dispersion within fire teams.
- Were less likely to place the lead fire team leader in the point.
- Moved more cautiously when contact was likely.
- Were less likely to be detected by the "enemy."
- Detected the "enemy" more often before contact.
- Communicated intelligence information from squad members more often.
- Were more directly controlled by their leaders.
- Established more effective overwatch positions from which to deliver covering fire by both individual and crew-served weapons.

- Reacted to contact in a more organized manner.

- Were better able to reorganize for continuing their mission after engagement with "enemy" snipers.

Thus, although the performance of both REALTRAIN and conventional squads improved following training on those measures of performance called out in the ARTEP (use of overwatch and use of cover and concealment afforded by the terrain), REALTRAIN squads showed a greater improvement on these measures and also improved on other skills reflected in measures of security, observation, and command and control. Moreover, the performances of REALTRAIN squads during the movement-to-contact was highly correlated with their performances during contact and strongly correlated with mission success.

CONCLUSIONS

The results have shown that REALTRAIN training can substantially increase the tactical proficiency of rifle squads during movement as well as during contact. The results have shown, further, that performances during movement are highly correlated with subsequent performances during contact.

Current ARTEPs do not provide sufficient guidance for trainers to diagnose specific training deficiencies or to design economical and efficient training programs. In addition to "success-in-battle" measures, effective evaluations of training needs must be based on process measures of complex tactical skills. Some of the critical tactical skills, intermediate products, and measurement procedures for rifle squads are identified and treated in this and earlier reports. Further, the findings presented in these reports suggest that the tactical skills acquired during training on one situation or mission can be shown to transfer to other situations and missions. Therefore, the trainer may be able to achieve greater economy in his training program if he can more effectively determine what skills his unit possesses. Thus, the data and analyses presented here indicate not only the substantial training benefits to be derived from use of engagement simulation methods, but they also represent a major step toward the development of improved ARTEPs.

TECHNICAL SUPPLEMENT

METHOD

General

The data this report is based on were collected during research conducted at Fort Ord, Calif., during March, April, and May 1977 to validate REALTRAIN training methodology and to identify critical measures of tactical performance for infantry rifle squads. Player and support personnel were supplied by the 7th Infantry Division at Fort Ord.

During those 3 months, 18 infantry squads underwent 2-week training programs for both tactical testing and training. Squad performance was evaluated before and after training during ARTEP-based tactical tests that incorporated movement-to-contact/attack and defense missions against a standard opposition force (OPFOR). Data reported here were gathered during the movement-to-contact portion of these tactical tests. In addition, following posttraining tests, units trained by REALTRAIN and by conventional methods opposed one another in a series of attack-defense missions (shootoffs). Methodology and procedures for conducting the entire research effort have been covered in earlier reports (Banks et al., 1977; Meliza et al., 1979). REALTRAIN casualty assessment methods were used during testing. Measures of tactical performance included both terminal product and process types.

Personnel

General

Army test personnel were assigned duty positions based on their individual qualifications. These included data collectors, controllers, radio-telephone operators (RTOs), training officers and noncommissioned officers (NCOs), and support personnel. Scientific staff members monitored all phases of testing and training to insure that test procedures and scenarios were accurately replicated. They also collected data on some aspects of performance.

Players and OPFOR

Players were members of 18 rifle squads from the 7th Infantry Division. Because one REALTRAIN and one conventional squad were without key squad members during the scheduled posttraining test, their results were not included. Therefore, the sample was reduced to 16 squads, with 8 squads in each training group. Each nine-man squad was composed of a squad leader, two fire team leaders, four

riflemen, and a two-man M60 machinegun team. The OPFOR defenders were drawn from a 7th Division squad. In addition, two riflemen functioned as OPFOR along the tactical test lanes. The integrity of player and OPFOR squads was maintained throughout the test.

Test Controllers/Data Collectors

Two civilian scientists, four officers, two NCOs, and seven enlisted men were trained as REALTRAIN controllers and as data collectors. Several members of this group acted in more than one capacity during testing. All REALTRAIN controllers functioned as data collectors during the movement-to-contact phase of the tactical test, before engagement. Some members of the OPFOR also had data collection functions. The civilian scientists performed both as test monitors and as data collectors.

Test Personnel Training

Controller/Data Collectors

All controller/data collectors and civilian scientists received training and became familiar with the tactical scenario and test lanes the week before the test. During this period, practice exercises on the test lanes were carried out to verify the feasibility of executing the tactical scenario, to establish realistic test lane boundaries, and to insure that all controller/data collectors were able to carry out their duties accurately and reliably.

OPFOR

The OPFOR was given several days of tactical training using REALTRAIN prior to the pretraining and posttraining tests to bring the force to a high level of tactical proficiency. Much of this training was experiment-specific and conducted on the test lanes to insure that the OPFOR attacks and defenses during the pretraining and posttraining tests were executed in a tactically proficient and standardized manner.

Test Design

Schedule

The field experiment consisted of four phases of tactical training and performance testing, replicated in three cycles. Each cycle consisted of the testing and training of six rifle squads during a 2-week period (see Table 1). Phase I was an ARTEP-based pretraining test administered to establish entry-level tactical proficiency and to establish the equivalence of squads to be trained. The test consisted of two missions: a movement-to-contact/attack on a prepared

position and a hasty defense. This report covers data collected in the movement/attack phase only. Test squads were opposed by a trained and standardized opposition force. Three squads were tested each day. Upon completion of Phase I, the six squads were ranked in terms of their judged tactical proficiency and then assigned to either REALTRAIN or conventional training groups. Rankings were based upon military judgment made by field grade (O4) infantry officers and supplemented by readily determinable objective data such as casualties sustained and inflicted. In each cycle, three squads were assigned to each training group so as to balance, as much as possible, the entry-level proficiency of the squads in the training groups. Over the three cycles, nine squads received REALTRAIN training and nine squads received conventional training.

Table 1

Chronological Sequence of Events Within a Cycle

Week 1					Week 2				
Day			Day		Day			Day	
1	2		3	4	5	1	2	3	4	5
Training in REALTRAIN procedures		Training				Posttest			Shootoffs	
Pretest										

Phase II consisted of a 3-day training period during which squads received either REALTRAIN or conventional training. Trainers were two experienced and accomplished infantry officers (both captains); one officer trained the squads with REALTRAIN, and the other trained with conventional methods. Both trainers were given the same training guidance (based on ARTEP 7-15), and both independently developed a 3-day program of instruction (POI) for the attack and hasty defense missions. Each POI was reviewed and discussed with the trainer to insure that the two POI were comparable and that both trainers were training on the same missions, tasks, and conditions. Conduct of training was monitored to insure that the POIs were followed. As long as the trainers stayed within the broad limits of the approved POI, however, they were allowed to adjust their training to meet the needs of the squads they were training.

The same materiel, training resources, terrain, and personnel (with the exception of REALTRAIN controllers) were available to both trainers. Controllers are required for casualty assessment in REALTRAIN exercises but are not required in conventional exercises.

Phase III consisted of a posttraining tactical performance test. The test was the same as that administered during Phase I except that it was conducted on a different test lane.

Phase IV consisted of tactical exercises in which REALTRAIN and conventional units opposed one another. Data collected during Phase IV were collected only during contact and consisted primarily of casualties inflicted and casualties sustained. These data are not reported in this report.

Pretraining and Posttraining Tests

Phase I and III tactical performance tests consisted of a movement-to-contact/attack followed by a hasty defense. The scenario for these tests was based on the guidance provided by ARTEP 7-15, but it was greatly expanded to accommodate the large number of performance measures required for detailed performance analysis.

Two test lanes were used; each squad was administered the pretraining test on one lane and the posttraining test on the other. The order of lane use in pretests and posttests was counterbalanced to minimize any possible lane effects. The two lanes covered similar terrain, which was moderately wooded with designated routes of advance lying along clearly identifiable ridge lines. Lane boundaries were placed so that squads had adequate freedom to maneuver yet were constrained to move generally along the ridge lines.

Major events in the tactical scenario consisted of occupation of an assembly area, movement, crossing a danger area, reaction to an enemy observation post (OP) and an attack on that OP, and the set-up and conduct of a hasty defense. Appendix A provides a sketch map of one of the lanes (Lane 2). This report is concerned with the squad's actions from the assembly area through the attack on the OP.

Assembly Area. Upon arrival at a test lane, the squad leader was told that he was to occupy tactically a squad sector of a platoon perimeter, and he was given the boundaries of his area of responsibility. After the squad had occupied its position, the squad leader was given a standardized operations order by the senior controller, who simulated the platoon leader. At that time, he was given a sketch map of the immediate terrain with his route of advance marked on it. The squad leader was given 15 minutes to brief his men and prepare to cross the line of departure (LD).

Danger Area. Along their avenues of advance, squads were required to cross a clearly hazardous "danger area" consisting of a clearing bisected by an unimproved road. On the far side of the danger area were two riflemen in concealed positions, located so that they could observe the squad as it approached the danger area. These "snipers" served two functions: (a) They documented the squads' use of stealth as the squads approached the danger area, and (b) they forced the squad to deploy by firing 3- to 5-round bursts of M16 rifle fire at 10- to 15-second intervals for 2 minutes or until each had been declared a casualty. Fire began after the first squad member crossed the danger area road. If the snipers were not declared casualties after 2 minutes, they withdrew, moving by bounds, along a predesignated path that ran obliquely to their rear and off the test lane. No squad casualties were assessed during this engagement.

The OP. Farther along the course, the tested squads encountered an enemy OP manned by an M60 machinegun team and two M16 riflemen. The force ratio for this encounter was approximately 2:1. The OP consisted of well-prepared, dug-in, and camouflaged positions. The terrain in front of the OP was relatively open and provided excellent fields of fire and a decided advantage to the defending OPFOR. If the squads did not take the OP under fire before crossing a point approximately 50 m from the OP (designated Control Phase Line C), the squad was taken under fire by the OPFOR defenders. The senior OPFOR controller was responsible for insuring that this rule was followed.

The engagement was allowed to continue until either (a) the tested squad had only one survivor, (b) the OPFOR had all been declared casualties, or (c) either side had become sufficiently suppressed or disorganized so that continuation was not feasible. These determinations were made jointly by the civilian scientist and the senior controller.

After the engagement, an administrative break was called and squads were reconstituted, resupplied, and moved administratively to the site of the hasty defense. Because data from the defense will not be motivated here, the methods for that module are not presented.

Materiel, Weapons, and Ammunition

All players arrived at the test site with their weapons and an AN/PRC-77 tactical radio. Prior to the tactical test movement-to-contact/attack, each tested unit rifleman was issued 140 rounds of blank 5.56 ammunition and three practice hand grenades; each machinegun team was issued 400 rounds of blank 7.62 ammunition and six practice hand grenades. Each squad also received six smoke grenades. In addition, all players were issued REALTRAIN equipment consisting of helmet covers bearing a 3-inch high, two-digit number, 6X-power telescopes for M16 riflemen, and a pair of 7 x 50 binoculars for each machinegun team. During the test, squad members' ammunition and pyrotechnic supplies were replenished prior to the hasty defense.

During training periods, both training groups received grenade simulators, smoke grenades, 5.56 blank rounds, 7.62 blank rounds, practice claymores, and practice grenades. Also, REALTRAIN units received the REALTRAIN equipment listed above.

Squad Training

The tactical test used REALTRAIN rules of engagement. The ability to inflict casualties under REALTRAIN rules of engagement partially depends on the ability to identify two-digit helmet numbers using a 6X telescope mounted on the M16 rifle. Therefore, all player squads were given extensive training in the use of telescopes for inflicting casualties prior to the administration of pretests. This training allowed meaningful casualty assessment in the pretest and insured that subsequent differences in tactical proficiency between training groups were not due to a difference in the ability to use the telescopes to see the numbers.

REALTRAIN and conventional squads received 3 days of tactical training following the pretest. During this period, two training areas were rotated between groups so that each had equal access to the terrain. Training areas were separated from testing areas. All training and testing areas had similar terrain.

On each training day, a civilian scientist or infantry officer was assigned to each training group to monitor the content and method of training. These training monitors also insured that conventional squads were not trained using actual or approximations of REALTRAIN methods.

Rules of Engagement

The rules of engagement were generally those contained in TC 71-5, "REALTRAIN: Tactical Training for Combined Arms Elements," and in ST-7-2-172, "SCOPES: Squad Combat Operations Exercise (Simulation)."

All players were identified by a 3-inch high, two-digit number on helmet covers. When a controller told a player that the player had become a casualty, the player was ordered to remove his helmet and lie down in his position. Controllers insured that players who had been declared casualties did not become reinvolved in the engagement.

Casualties could be inflicted by the simulated use of the M16 rifle, the M60 machinegun, hand grenades, or claymore mines. No indirect fire was played during any portion of the test. Controllers used criteria to assess casualties as specified in TC 71-5 and ST-7-2-172. Described below are instances when procedures and criteria for assessing casualties were modified to accommodate experimentation

objectives or to capitalize on recently developed REALTRAIN/SCOPES techniques.

M60 Machinegun. In general, the proposed concept in TC 71-5 was followed for simulating the effects of the machinegun. An extension of this procedure was used to permit the machinegun to provide suppressive fire. When the gun is firing, the nearest controller determines its direction of fire and reports this over the control radio net. For example, if the machinegun fire is oriented toward the left flank of the opposing force position, the controller will call "Suppression, left flank" over the radio; if the fire is directed at the smoke cloud from a smoke grenade, the controller will call "Suppression, smoke." The controller on the opposite side determines if any opposing force personnel are in the area and tells them they are receiving fire (e.g., "Suppression, fire team bravo"). If any player in the area receiving fire then remains exposed or tries to move without cover, he is assessed a casualty.

Data Collection

During the tactical testing periods, four test staff members collected data while with the tested unit, three collected data while stationed along the test lane, two collected data and were located with the OPFOR, and two were remotely located and collected data from radio traffic. The data collection procedures for each of these groups are summarized below. They are fully described in Meliza et al., 1979.

Tested Unit Data Collection. Two infantry officers (controllers), one civilian scientist, and one enlisted man accompanied the tested units to collect data on squad formations, techniques of control and communication, responses to fire, etc. The senior controller (controller 1) traveled with the lead fire team, the second controller (controller 2) traveled with the trailing fire team, and the civilian scientist (data collector) accompanied the squad leader. The enlisted man followed the squad and constructed maps of squad movements and positions. All movement of data collectors and controllers was tactical, and care was taken to insure that staff members did not compromise either movements of or positions occupied by the tested squads. Controllers 1 and 2 performed as data collectors before contact was established and as controllers during engagements. To facilitate the collection of data at specific points in the course, tactically realistic phase lines were established (e.g., Phase Line A, between the LD and the danger area; and Phase Line C, between the danger area and the OPFOR OP).

Test Lane Data Collection. Three enlisted men were prepositioned on the test lanes to collect data on squad performance from the potential enemy point of view. One was positioned near the assembly area to collect data on the squads' occupation of the assembly area. The

other two were "snipers" who collected data on the way in which the squad approached the danger area.

OPFOR Data Collection. Two NCOs were prepositioned with the OPFOR to collect data on tested squads from the OPFOR point of view. These men (controllers 3 and 4) were stationed at OPFOR's OP during the movement-to-contact/attack phase to collect data on the tested squads' stealth (a) during movement prior to contact and (b) on their movements during contact.

Remote Data Collection. Two enlisted men, located at the experimentation control center (ECC), collected data from radio traffic. One of these men operated the REALTRAIN Net Control Station (NCS) and recorded all data regarding casualties and data on scenario events (e.g., time of crossing control phase lines). The other monitored the squad-platoon tactical net and recorded reports from the tested squad to his (simulated) platoon leader.

Experimentation Site

The experimentation site consisted of two tactical test lanes, two shootoff test lanes, two training areas, and the ECC. The ECC was located between the two tactical test lanes and provided a centralized area for arrival and departure of troops, ammunition and materiel issue and turn-in, issue and collection of data forms, and remote data collection.

The experimentation site terrain was generally uniform, consisting of moderately wooded small hills with some open depressions.

Communications

Communications among controllers and between the NCS and controllers were made via AN/PRC-77 tactical radios. Communications between tested squads and a simulated platoon headquarters located at the ECC used AN/PRC-77s, but on a separate frequency. Other test staff data collectors used small, two-channel commercial ("walkie-talkie") radios to communicate among themselves and to the ECC.

RESULTS

Introduction

Earlier reports (Banks et al., 1977; Meliza et al., 1979) covering performance during engagements showed that REALTRAIN-trained squads in the attack achieved greater success than conventionally trained squads in engagements, as measured in mission accomplishment and casualties inflicted and sustained. The reports showed that REALTRAIN squads' success resulted from better use of cover and concealment, better use

of weapons, and better coordination of base of fire and movement elements.

It was also shown that REALTRAIN squads, in an attack on an enemy observation post, differed from conventionally trained squads in the first few critical minutes of the engagement in casualties sustained, immediate reaction of the squad leader and squad members to fire, timely employment of crew-served weapons in returning fire, etc.

Indeed, the ability of the REALTRAIN squads to minimize casualties during the first few minutes of contact while they carefully developed the situation was a major factor in their success. The ability of the squad to respond adaptively upon sudden contact with the enemy, however, is dependent in part upon its tactical disposition at that moment; this disposition is dependent in turn upon its behavior during movement-to-contact. Therefore, this report will examine the behavior of the squad during the movement-to-contact phase of the mission in an attempt to identify observable, critical behaviors that predispose the squad to success after an engagement begins.

Results are divided into three sections. The first section describes the tactical disposition and behavior of the squad during movement-to-contact. The second section examines how the squad reacted to initial contact and prepared for the subsequent engagement. The third section summarizes the results and discusses their implications.

This examination should serve a number of purposes: First, it will help determine which tactical skills are taught in REALTRAIN and conventional training; second, it will gage the effectiveness with which precontact performance measurement can be used to predict subsequent performance under fire; third, it should substantially aid the development of engagement-simulation ARTEPs that permit economical training and afford diagnostic evaluation of small-unit training requirements.

Section 1: Movement-to-Contact

During movement, a squad's formation and the interrelationships among its members are constantly changing because of terrain, distance traveled, expected imminence of contact, control requirements, etc. Thus, the overall adequacy of a unit's movement can be gaged only by observations made of behaviors over a period of time. For this test, objective measures of critical behaviors were used whenever possible. These measures included frequency counts, times, and repeated observation of selected behaviors at designated locations (control phase lines). The two control phase lines were the Line of Departure (LD) and a line identifiable for the data collectors (such as Control Phase A) some 200 m beyond the LD. The objective measures were supplemented by behavioral ratings made by infantry officers traveling with the squad as controllers/data collectors (see Methods section).

Values shown in the tables are usually based on eight squads in each training group. Occasionally, however, the "n" for some table is smaller than 8 because of missing data.

Formation

The unit adopted a formation during movement to protect its members, to facilitate observation and control, and in general to maintain readiness to react to contact. The aspects of the formation observed included how a point element was used and protected, separation and use of overwatch by fire teams, dispersion of squad members, and location in the squad of the squad and fire team leaders.

The Point. All squads used a point element in front of the leading fire team to facilitate observation and to minimize vulnerability of the main body of the squad. Table 2 shows the mean distance of the point man from the first man in the lead fire team at the two phase lines (LD and Phase Line A). In the pretest, the two training groups did not differ greatly, with the point some 18 m to 26 m in front of the REALTRAIN squads and 21 m to 26 m in front of the conventional squads. In the posttest, the REALTRAIN squads consistently had the point farther out (39 m to 44 m) than the point of the conventional squads (approximately 22 m to 25 m).

Table 2

Mean Distance (in Meters) of Point Man in Front of Squad

	Control phase line	Training method	
		REALTRAIN	Conventional
Pretest	Line of departure	25.6	21.2
	Phase Line A	18.1	26.2
Posttest	Line of departure	43.6	22.5
	Phase Line A	39.4	25.0

Because of its position in advance of the main body, the point is likely to make first contact with the enemy. Protection of the point is therefore very important. Table 3 shows the percentage of squads in which at least one man was in a position to provide covering fire for the point man. In the pretest, the point was protected in this manner in half or less of the squads. In the posttest, most (about 88%) of the REALTRAIN squads were covering the point man. The

conventional squads did not change after training, and overwatch for the point was provided in only half of the squads.

Table 3

Percentage of Squads in Which Point Man Was Covered by at Least One Man

	Control phase line	Training method: REALTRAIN	Training method: Conventional
Pretest	Line of departure	43 (n = 7)	50
	Phase Line A	33 (n = 6)	50
Posttest	Line of departure	88	50
	Phase Line A	86 (n = 7)	50

Overwatch. Separation between fire teams helped the trailing fire team to provide overwatch for the lead fire team. Separation was measured in terms of the distance between the trailing individual in the lead fire team and the first man in the trailing fire team. Table 4 shows this separation at the LD and Phase Line A. For the REALTRAIN squads, separation increased from about 12 m in the pretest to about 16 m in the posttraining test. The conventional squads, on the other hand, slightly decreased their separation of fire teams, going from a mean of about 14.5 m in the pretest to a mean of about 13 m in the posttest. Thus, the fire teams were separated in both groups. After training, however, the REALTRAIN squads showed some tendency to increase separation of squad elements, just as they did with the point man.

The senior military controller, who tactically moved with the squad, evaluated the squad on the use of an overwatch movement formation. Table 5 shows that, with training, both groups slightly increased their frequency of use of an overwatch formation (either traveling overwatch or bounding overwatch). The senior controller also rated the squad on how much of the time the trailing fire team provided overwatch for the leading fire team. Table 6 shows the median ratings. After training, both groups slightly increased their frequency of overwatch.

Table 4

Mean Distance (in Meters) Between Fire Teams

	Control phase line	Training method: REALTRAIN	Training method: Conventional
Pretest	Line of departure	11.9	13.4
	Phase Line A	11.6	15.6
Posttest	Line of departure	16.3	12.8
	Phase Line A	15.9	13.1

Table 5

Percentage of Squads Using Bounding or Traveling Overwatch During Movement

	Training method: REALTRAIN	Training method: Conventional
Pretest	63	43[a]
Posttest	71[a]	50

[a] n = 7

Table 6

Median Ratings[a] of Overwatch of Lead Fire Team by Trailing Fire Team

	Training method: REALTRAIN	Training method: Conventional
Pretest	3	5
Posttest	2.5	4.5

[a] Ratings were made on a 7-point scale from 1 = all of the time to 7 = none of the time.

Dispersion. Separation of individual squad members also helped reduce casualties from indirect and direct fire. Dispersion within the squad was gaged by instances of three or more men moving within 10 m of each other (bunching). Table 7 shows that 83% of REALTRAIN squads showed bunching before training compared to only 17% of squads after training. The conventional squads showed considerable bunching in both pretraining (63%) and posttraining tests (71%). Thus, after training REALTRAIN squads again tended to separate squad elements and to move in a more open formation, whereas conventional squads did not.

Table 7

Percentage of Squads With Three or More Men Bunching (Phase Line A)

	Training method	
	REALTRAIN	Conventional
Pretest	83[a]	63
Posttest	17[a]	71[b]

[a] n = 6.

[b] n = 7.

Location of Squad Leader. During movement, the squad leader must place himself in a position both to control the squad and to protect himself from enemy fire. Although there is no absolute rule on where the squad leader should be located, his ability to receive information and to control the actions of the squad is reduced if he is too close to the front or the back of the formation. Further, if he is in the point element, his vulnerability to enemy fire is greatly increased. Considering these factors, the changes with training are interesting.

Table 8 shows where the squad leader positioned himself during movement. In the pretest, half of the squad leaders in both groups moved with the lead fire team, and the remainder moved with the trailing fire team or the point. In the REALTRAIN group during the posttest, seven squad leaders were positioned in the lead fire team and one leader with the trailing fire team. In the conventional group, five squad leaders were with the lead fire team and three were with the trailing fire team. No squad leaders in either group were with the point. Thus, after training, there was a strong tendency in the REALTRAIN group for the squad leader to position himself in the lead fire team, where he was less vulnerable than in the point and better able to control the actions of the squad than in the trailing fire

team. In the conventional group, a slightly greater tendency existed for the squad leader to be in the trailing fire team, where control of the squad element making first contact with the enemy would be more difficult.

Table 8

Location of the Squad Leader During Movement

	Training method					
	REALTRAIN			Conventional		
	Location			Location		
	Point	Lead FT	Trail FT	Point	Lead FT	Trail FT
Pretest	1	4	3	2	4	2
Posttest	0	7	1	0	5	3

Location of Fire Team Leader. Considerations of vulnerability and control are also important for the lead fire team leader. Table 9 shows the percentage of squads in which the lead fire team leader was part of the point, as opposed to moving with the bulk of the fire team. In the pretest, all lead fire team leaders were in the point. After training, half of the fire team leaders in the REALTRAIN group had moved into the main body of the fire team, where they were less vulnerable and had potentially improved control. In the conventional group, all fire team leaders remained in the point. Further, as Table 3 shows, frequently no one in the conventional squads was protecting the point by providing overwatch.

Table 9

Percentage of Squads in Which the Leading Fire Team Leader Was Part of the Point

	Training method	
	REALTRAIN	Conventional
Pretest	100	100
Posttest	50	100

To summarize, before training, REALTRAIN and conventional groups were roughly equivalent on most measures. After training, the conventional squads showed little change. In contrast, the REALTRAIN squads moved in a more dispersed formation, but one that provided better control and mutual support.

Caution

Speed of Movement. After departure from the assembly area, each squad moved through moderate to heavy cover for some 200 m before reaching an open "danger area" where contact with the enemy was first made. Table 10 shows the mean time taken to move from the assembly area to the danger area. In the pretest, the movement times for the two groups were about equal for REALTRAIN (15.0 minutes) and conventional squads (16.2 minutes). In the posttest, the REALTRAIN squads more than doubled the time taken for movement, to 36.5 minutes. The conventional squads, however, reduced their time slightly, to 14.2 minutes.

Table 10

Mean Time (in Minutes) From Squad's Leaving Assembly Area to Its Arrival at the Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	15.0	16.2
Posttest	36.5	14.2

These data suggest that, after training, REALTRAIN squads were moving much more cautiously. This possibility is confirmed by the controllers' ratings. After the test, the officer acting as senior controller rated the squad on its caution, using a 7-point scale from 1 = extremely careful to 7 = extremely careless (Table 11). In the pretest, both groups were rated in the middle to careless part of the scale, with median ratings of 5.0 for REALTRAIN and 3.5 for conventional squads. After training, median ratings showed REALTRAIN squads as much more careful (1.5), whereas conventional squads were not more careful (5.0).

Table 11

Median Ratings[a] of Carefulness of Squads

	Training method	
	REALTRAIN	Conventional
Pretest	5.0	3.5
Posttest	1.5	5.0

[a]Ratings were made on a 7-point scale from 1 = extremely careful to 7 = extremely careless.

Cover and Concealment. If the REALTRAIN units were indeed moving more cautiously, not just more slowly, than the conventional units, they should have made better use of available cover and concealment. Table 12 shows the percentage of squads with two or more men moving in the open at Phase Line A. In the pretest, both groups used poor cover and concealment: 83% of the REALTRAIN squads had been exposed compared to 100% of the conventional squads. In the posttest, both groups showed large improvement--17% of the REALTRAIN squad had been exposed compared to 38% of the conventional squads; the REALTRAIN squads used cover and concealment more effectively than the conventional squads.

Table 12

Percentage of Squads With Two or More Men Moving in the Open (Phase Line A)

	Training method	
	REALTRAIN	Conventional
Pretest	83[a]	100
Posttest	17[a]	38

[a]n = 6.

Stealth. The real test of carefulness of movement is to be able to approach an enemy position unheard and unobserved. Two OPFOR riflemen were positioned at the danger area where they could observe squad movement. (They subsequently engaged the squad to permit observation of how the squad responded to contact.) Table 13 shows the percentage of squads heard by the two OPFOR riflemen as the squads approached the danger area. In the pretest, the majority of squads in both groups were heard before they were seen (63% of the REALTRAIN squads and 75% of the conventional squads). In the posttest, the number of REALTRAIN squads heard decreased to 38%, and the number of conventional squads heard increased to 100%.

Table 13

Percentage of Squads Heard by OPFOR Riflemen as Squad Approached Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	63	75
Posttest	38	100

The data are similar for the number of sightings of tested squad members (Table 14). In the pretest, the two training groups were about the same: A mean of 2.0 men in a REALTRAIN squad were seen before they attempted to cross the danger area compared to a mean of 1.8 men in the conventional squads. In the posttraining test, the mean number of men seen in a REALTRAIN squad was cut in half, to 0.9, while the number seen in a conventional squad increased slightly to 2.2. Thus, REALTRAIN units in the posttest were less visible and moved more quietly than did conventional units.

To summarize the findings on the movement phase, after training, REALTRAIN squads adopted a dispersed formation with the point farther in front of the squad, reasonable separation of the fire teams, and less frequent bunching of individual squad members. At the same time, the squads showed improved use of overwatch to protect squad elements. The squads moved more slowly and cautiously, with better use of cover, and were less often seen or heard by alert OPFOR personnel. The squad leader and lead fire team leader positioned themselves more often where they had better protection and where they were better situated for controlling their element. Overall, the picture is of a cautious, controlled, mutually supporting squad that is ready to react when contact is made. The conventional squads, however, showed fewer marked

changes after training and seemed less prepared to react to contact. The real test of the "goodness" of a unit's movement, however, is its ability to respond effectively when contact is made. The next section will examine the squads' reaction to contact.

Table 14

Mean Number of Tested Squad Members Seen by OPFOR Riflemen Before Squad Crossed Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	2.0	1.8
Posttest	0.9	2.2

Section 2: Contact

In the test design, each squad was given a period of free movement (described in the previous section) before any contact was made with the enemy. Initial contact was made as the squad crossed a dirt road and a wide, open area with minimal cover and with good enemy observation and firing positions on the far side. It was expected that the squads would recognize this as a "danger area," thus providing evaluators an opportunity to observe the squad's reaction, deployment, and preparation for crossing.

As explained earlier, two OPFOR riflemen, concealed on the far side, were initially passive data collectors--they recorded their observations of the test squad but did nothing to affect its behavior. As soon as the first man of the squad began to cross the danger area, however, these OPFOR opened fire with M16 rifles, continued harassing fire for a short period, and then withdrew by covered routes. No casualties were assessed in the test squads, because the purpose of these riflemen was to provide an opportunity to observe the squad's movement when it had the tactical problem of crossing an open area under harassing fire. (It was also desirable that all squads be initially at full strength when they subsequently encountered and attacked the enemy OP.) After crossing the danger area, the squads continued their movement, under conditions where reestablishment of contact was imminent.

Reaction to Danger Area

Reaction of Point Man. It was expected that most squads would recognize the danger area and make observable tactical preparations for crossing. Specifically, it was expected that such preparations could be seen in how squads stopped, searched, communicated, controlled, deployed, and used their weapons. Table 15 shows the percentage of squads in which the point man stopped before entering the danger area. In both the pretests and posttests, almost all point men stopped, thus indicating their awareness of the threat posed by the open area to their front.

Table 15

Percentage of Squads in Which Point Man Stopped at Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	100	88
Posttest	88	88

Table 16 shows the percentage of squads in which the point detected the OPFOR riflemen before these riflemen opened fire. In the REALTRAIN group, only 13% detected the OPFOR in the pretest, compared with 50% in the posttest. In the conventional group, the corresponding data were 25% in the pretest and 13% in the posttest. Thus, after training, the REALTRAIN point element showed improvement in his surveillance function, whereas the conventional point did not.

It is important that squad members tell leaders about hazards they encounter. Table 17 shows the percentage of squads in which there was a report from the point to the lead fire team leader upon either detection or initial engagement. In the REALTRAIN group, the squads reporting increased from 43% in the pretest to 100% in the posttest. For the conventional group, the percentage of squads reporting was quite high in the pretest (75%) but decreased to 57% in the posttest. Thus, with training, REALTRAIN squads greatly improved their information flow, but conventional squads did not.

Table 16

Percentage of Squads in Which Point Detected OPFOR Before Engagement at Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	13	25
Posttest	50	13

Table 17

Percentage of Squads in Which the Point Provided Information on the Enemy to His Fire Team Leader

	Training method	
	REALTRAIN	Conventional
Pretest	43[a]	75
Posttest	100	57[a]

[a] $n = 7$.

Control. Preparation for crossing the danger area might require more active control of leading squad elements; therefore, a tally was made of each communication from the lead fire team leader to a member of the fire team as it moved from a line about 50 m from the danger area until the first shots were fired. (A communication was defined as any order given to a member of the team, whether a verbal message or a nonverbal gesture or signal.) The mean number of such communications is shown in Table 18. The REALTRAIN squads doubled their number of communications, from a mean of 3.1 in the pretest to 6.2 in the posttest. The conventional squads showed little change after training, with a mean of 2.6 in the pretest and 2.0 in the posttest. Therefore, after training, REALTRAIN leaders tried to more actively control their squad members than did conventional leaders.

Table 18

Mean Number of Times Lead Fire Team Leader Communicated With Squad Members From Approach to the Danger Area to First Engagement of Enemy Snipers

	Training method	
	REALTRAIN	Conventional
Pretest	3.1	2.6
Posttest	6.2	2.0

Thus, most of the squads in both groups recognized the open ground as a danger area and stopped before entering it. After training, the REALTRAIN squads were more likely than conventional squads to detect the OPFOR before being engaged and to report initial contact to their leader. In turn, the lead fire team leader in the REALTRAIN squads was more actively controlling and directing members of his fire team in the time immediately prior to engagement.

Crossing the Danger Area

Overwatch. Given that the danger area was almost always recognized as dangerous, good tactical performance required that overwatch be established before anyone moved into the open area. Table 19 shows that in the pretest 63% of the REALTRAIN squads and 75% of the conventional squads established overwatch positions. Both groups increased slightly to 88% in the posttest. However, the effectiveness of overwatch may be gaged by the ability of the overwatching element to actually deliver fire on the enemy in response to its engagement of the forward element. Table 20 shows the percentage of squads that actually used M60 machinegun fire to engage or suppress the OPFOR. The REALTRAIN group showed an increase in the number of squads actually using the machinegun, from 25% in the pretest to 63% in the posttest. The conventional squads did not change in their frequency of employment, with only 13% of the squads using the machinegun in the pretest and in the posttest.

Table 21 shows similar data in terms of the percentage of squads in which the lead fire team actually delivered covering fire for the point. Again, the REALTRAIN groups showed an increase after training, from 25% in the pretest to 75% in the posttest; whereas the conventional

squads did not, with 50% in the pretests and 38% in the posttests. Thus, on both measures the product of effective overwatch--delivery of appropriate fire--improved in REALTRAIN but not in conventional squads.

Table 19

Percentage of Squads Establishing Overwatch Positions Before Anyone Crossed Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	63	75
Posttest	88	88

Table 20

Percentage of Squads Using M60 Machineguns at Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	25	13
Posttest	63	13

Use of Smoke. In moving across an open area under fire, an indicator of good tactical performance is use of smoke to augment natural concealment. Table 22 shows the percentage of squads that used smoke grenades to cover their movement at the danger area. In the pretest, use of smoke grenades was infrequent (13% for both groups). In the posttest, both groups increased their use of smoke, with a larger increase in REALTRAIN (63%) than in conventional (38%) squads.

Table 21

Percentage of Squads in Which Leading Fire Team Provided Covering Fire for the Point Upon Contact at the Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	25	50
Posttest	75	38

Table 22

Percentage of Squads Using Smoke Grenades at Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	13	13
Posttest	63	38

Control. The better integrated performance of the REALTRAIN squads compared with the conventional squads suggests differences in leader control during the engagement. The infantry officer who acted as senior controller and traveled with the lead fire team evaluated the lead fire team leader on active direction of the performance of his team members during the engagement at the danger area (see Table 23). REALTRAIN squads showed an increase after training in active control by the fire team leader of lead fire team members, from 50% of squads in the pretests to 75% in the posttests. The conventional squads did not increase, with 63% for the pretests and 50% for the posttests. This finding is consistent with the evidence presented earlier of greater control by the REALTRAIN fire team leaders immediately prior to the danger area engagement (Table 18).

The senior controller also rated, on a 7-point scale, the extent to which the lead fire team reacted to contact in an organized manner (1 = extremely organized and 7 = extremely disorganized). Table 24 shows the results. In the pretest, both training groups were evaluated as somewhat disorganized, with medians of 5 for REALTRAIN and

4 for conventional squads. In the posttest, REALTRAIN squads showed a considerable improvement (median = 2), but conventional squads did not (median = 5). Thus, subjective but experienced military judgment was in agreement with the objective measures and showed better integration and control in REALTRAIN than in conventional squads.

Table 23

Percentage of Squads in Which the Leading Fire Team Leader Directed Members Throughout the Engagement at the Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	50	63
Posttest	75	50

Table 24

Median Ratings[a] of Degree of Organization Exhibited by Lead Fire Teams in Reaction to Contact at Danger Area

	Training method	
	REALTRAIN	Conventional
Pretest	5	4
Posttest	2	5

[a]Ratings were made on a 7-point scale from 1 = extremely organized to 7 = extremely disorganized.

To summarize the reaction to initial contact, most of the squads in both training groups recognized the danger area. After training, REALTRAIN squads were more likely than conventional squads to detect the OPFOR riflemen prior to engagement and to report detection or first engagement to the lead fire team leader. REALTRAIN fire team leaders more actively directed their squad members in the preparation

for crossing the danger area. Both training groups established overwatch positions, but REALTRAIN squads more frequently used the positions to actually deliver fire, and they used smoke more often to cover their movement. Overall, both objective and subjective measures showed better controlled, organized, and integrated performance in REALTRAIN than in conventional squads.

Reestablishment of Contact

Caution. After the encounter at the danger area, contact with the enemy was lost because of the withdrawal of the OPFOR riflemen. Therefore, the test squads had to continue their movement while expecting reestablishment of contact at any time. Under these conditions, good tactical performance would require extremely careful movement. Table 25 shows the mean time, in minutes, from the arrival of the squads at the danger area until contact was reestablished at the enemy observation post. The training groups did not differ in the pretest (18.9 minutes for REALTRAIN and 18.8 minutes for conventional squads) or in the posttest (35.0 minutes for REALTRAIN and 32.8 minutes for conventional squads). A comparison of pretests and posttests shows that the time required almost doubled for both groups, suggesting a large increase in cautiousness of movement.

Table 25

Mean Time (in Minutes) From Squads' Arrival at Danger Area to Its Engagement at the Enemy Outpost

	Training method	
	REALTRAIN	Conventional
Pretest	18.9	18.8
Posttest	35.0	32.8

Control. Table 26 shows the mean number of times the lead fire team leader communicated with his fire team during this movement phase. In the pretest, the number of communications was about equal for the two groups, with a mean of 2.2 for the REALTRAIN and 3.1 for the conventional squads. In the posttest, the number of communications quadrupled to 8.9 in the REALTRAIN squads but remained about the same at 2.5 in the conventional squads. Thus, the slower movement was accompanied by an increase in active leader control in the REALTRAIN squads but not in the conventional squads.

Table 26

Mean Number of Times Leading Fire Team Leader Communicated With Fire Team Members During Movement to Reestablish Contact

	Training method	
	REALTRAIN	Conventional
Pretest	2.2	3.1
Posttest	8.9	2.5

Overwatch. Under conditions where contact with the enemy is imminent, good tactical performance requires that an overwatching element protect the lead element at all times. Table 27 shows the percentage of squads in which such an overwatch was provided. This measure was recorded for each squad at a designated location, just before the squad moved into an area where it could be engaged from the OPFOR OP. The squads using overwatch increased after training in the REALTRAIN group (50% vs. 75% of squads for pretests and posttests, respectively) but did not increase in the conventional group (13% vs. 0% of squads for pretests and posttests, respectively).

Table 27

Percentage of Squads in Which Trailing Fire Team Provided Overwatch for Leading Fire Team (Phase Line C)

	Training method	
	REALTRAIN	Conventional
Pretest	50	13
Posttest	75	0

Observation. It was possible for squad members to detect the camouflaged positions of the OPFOR OP if they moved cautiously and alertly. Table 28 shows the percentage of squads detecting the enemy OP before the OPFOR opened fire. In the pretest, both groups were equal, with 13% detections each. In the posttest, the number of squads

detecting the OP increased in the REALTRAIN group (to 38%) but did not in the conventional group (0%).

Table 28

Percentage of Squads Detecting Enemy Observation Post Before the Enemy Opened Fire

	Training method	
	REALTRAIN	Conventional
Pretest	13	13
Posttest	38	0

To summarize, as the squads moved to reestablish contact, squads in both groups moved more slowly after training. Squads in the REALTRAIN group were more alert, however, as indicated by the number of detections of the OP before firing. REALTRAIN squads were also under tighter control, as indicated by the number of orders given by the lead fire team leader, and they used overwatch more frequently at the critical moment just before the start of the engagement at the OP. Thus, because of their tactical disposition and organization, REALTRAIN squads were in a better position to respond effectively at the start of the engagement. These factors probably contributed to their ability to minimize the casualties suffered in the early minutes of the engagement and to mount a more deliberate and controlled attack that had a greater probability of success (Meliza et al., 1979).

Section 3: Summary

Performance During Movement

The preceding sections have described the actions of tested squads in movement-to-contact in terms of a number of measures of tactical performance. Yet probably no single behavior is essential for success. Rather, most likely the tactically proficient squad is one that is consistently alert, careful, mutually supporting, and well controlled. Therefore, a number of measures were selected from those presented in earlier sections. These measures, shown in Table 29, covered the entire movement-to-contact phase and were those for which a fairly clear-cut judgment of good or bad performance could be made. The pooled measures of tactical performance were drawn from a range of squad activities; these are broken down into the broad categories of tactical skills shown--Mutual Support, Protection and Observation, and Control

Table 29

Pooled Performance Measures

Mutual Support
1. Overwatch is consistently provided for point.
2. Squad uses overwatching movement formation.
3. Overwatch positions are established before point crosses danger area.
4. Lead fire team provides covering fire for point at danger area.
5. M60 machinegun provides covering fire at danger area.
6. Trailing element provides overwatch for lead element just before contact at OP.
Protection and Observation
1. Fewer than two men move in open.
2. Squad members do not bunch during movement.
3. Squad not heard by OPFOR riflemen as it approaches danger area.
4. Point man stops before entering danger area.
5. Squad detects OPFOR riflemen before engagement at danger area.
6. Fewer than two men seen by OPFOR rifleman before squad starts to cross danger area.
7. Squad uses smoke to screen movement across danger area.
8. Squad detects OP before OPFOR opens fire.
Control and Communications
1. Squad leader not part of point element.
2. Fire team leader not part of point element.
3. Point reports detection or initial engagement at danger area.
4. Fire team leader actively directs fire team throughout encounter at danger area.

and Communication. The two training groups were, therefore, compared on their performance in each of these skill levels and overall by determining the number of measures on which each squad scored positively.

Mutual Support. Table 30 shows the results for Mutual Support. The left column of the table indicates the number of measures on which squads were scored positively. The remaining columns indicate the number of squads scored positively on a given number of performances. In the pretest, the two groups were approximately equal; no squad scored positively on more than four measures. In the posttest, the REALTRAIN group improved substantially, with 63% of the squads scoring positively on five or more measures. None of the conventional squads scored positively on more than four measures.

Table 30

Mutual Support

No. of measures with positive scores	Number of squads[a]			
	Pretest		Posttest	
	REALTRAIN	Conventional	REALTRAIN	Conventional
0	0	1	0	1
1	1	0	0	1
2	4	3	0	2
3	0	3	3	2
4	3	1	0	2
5	0	0	2	0
6	0	0	3	0

[a]Number of tested units with positive scores on "n" performance measures during movement-to-contact, where "n" is the number in the left-most column.

Units were compared with respect to the number of squad actions performed in the Mutual Support category as a function of training group and test. The interaction between training group and test was significant ($p < .05$; ANOVA mixed design; see Appendix B). The effect of training on performance was significant for REALTRAIN units ($p < .05$; Tukey's HSD Test) but not for conventional units.

Protection and Observation. Table 31 shows the results for the Protection and Observation category. In the pretest, the groups did not differ, with only one squad (in the conventional group) being scored positively on more than four measures. In the posttest, the REALTRAIN group improved markedly, with six squads receiving positive scores on more than four measures. The conventional squads did not improve.

Table 31

Protection and Observation

No. of measures with positive scores	Number of squads[a]			
	Pretest		Posttest	
	REALTRAIN	Conventional	REALTRAIN	Conventional
0	0	0	0	0
1	4	3	0	1
2	0	3	1	4
3	3	1	0	3
4	1	0	1	0
5	0	1	4	0
6	0	0	1	0
7	0	0	1	0
8	0	0	0	0

[a]Number of tested units with positive scores on "n" performance measures during movement-to-contact, where "n" is the number in the left-most column.

Units were compared with respect to the number of squad actions performed in the Protection and Observation category as a function of training group and test. The interaction between training group and test was significant ($p < .005$; ANOVA mixed design; see Appendix B). The effect of training on performance was significant for REALTRAIN units ($p < .05$; Tukey's HSD Test) but not for conventional units.

Control and Communication. Table 32 shows the results for the Control and Communication category. Again, in the pretest two training groups were very similar, with six REALTRAIN and five conventional squads receiving positive scores on two or less measures. In the posttest, all REALTRAIN squads received positive scores on three or more measures, whereas the conventional group did not change.

Units were compared with respect to the number of squad actions performed in the Control and Communication category as a function of training group and test. The interaction between training group and test was significant ($p < .025$; ANOVA mixed design; see Appendix B). The effect of training on performance was significant for REALTRAIN units ($p < .05$; Tukey's HSD Test) but not for conventional units.

Table 32

Control and Communication

No. of measures with positive scores	Number of squads[a]			
	Pretest		Posttest	
	REALTRAIN	Conventional	REALTRAIN	Conventional
0	0	0	0	0
1	4	2	0	2
2	2	3	0	3
3	2	3	6	3
4	0	0	2	0

[a]Number of tested units with positive scores on "n" performance measures during movement-to-contact, where "n" is the number in the left-most column.

Overall Tactical Performance. Table 33 shows the overall results on the 18 measures. In the pretest, both groups were equal in performance. Most of the squads in both groups were scored positively on 6 to 9 measures, with the highest score, 10, for a conventional squad. In the posttest, the distribution of scores for the conventional group remained the same, and again only one squad achieved a score of 10. However, only one REALTRAIN squad scored below 10, indicating a broad-based improvement in the performance of REALTRAIN squads.

Units were compared with respect to the number of squad actions performed as a function of training group and test. The interaction between training group and test was significant ($p < .005$; ANOVA mixed design; see Appendix B). The effect of training on performance was significant for REALTRAIN units ($p < .05$; Tukey's HSD Test) but not for conventional units. Thus, the test data clearly indicate that REALTRAIN squads not only performed better than conventional squads on individual tactical performance measures and in certain skill areas,

but that they also performed consistently well across a variety of measures.

Table 33

Overall Performance

No. of measures with positive scores	Number of squads[a]			
	Pretest		Posttest	
	REALTRAIN	Conventional	REALTRAIN	Conventional
3 or fewer	1	1	0	1
4-5	1	1	0	0
6-7	3	3	0	4
8-9	3	2	1	2
10-11	0	1	1	1
12-13	0	0	3	0
14-15	0	0	2	0
16-18	0	0	1	0

[a]Number of tested units with positive scores on "n" performance measures during movement-to-contact, where "n" is the number in the left-most column.

To summarize, after training, REALTRAIN squads performed better than conventional squads across a large number of performance measures. Further, REALTRAIN squads were superior to conventional squads in the specific skill areas reflected in the measures of Mutual Support, Protection and Observation, and Control and Communication. Overall, squads trained by REALTRAIN were more consistently alert, careful, mutually supporting, and well controlled than squads trained by conventional training methods.

Prediction of Performance During Engagement

A previous report (Meliza et al., 1979) of actions during the attack on the enemy OP showed that REALTRAIN squads performed better than conventional squads both on individual tactical performance measures and across a variety of measures. The measures aggregated into a single pooled score were (a) "stalled" in place (i.e., paused at the beginning of the engagement to organize the attack); (b) used

overwatch; (c) used suppressive fire; (d) used M60 machinegun; (e) employed an organized flanking maneuver; (f) had leader-controlled squad; and (g) performed as an integrated unit. It was found that these pooled scores of "process" measures of tactical performance not only discriminated between REALTRAIN and conventional squads, but were also closely related to terminal product measures (i.e., casualties inflicted and sustained).

To determine the degree of relationship between these two types of measures, a casualty exchange index (CEI) was calculated and correlated with the pooled measures. The CEI equals the number of casualties inflicted minus the casualties sustained by the tested units during the attack. The product-moment correlation coefficient between the CEI and the pooled measures was 0.60 ($p < .001$) for pretraining and posttraining tests, indicating a close correspondence between product and process measures during actual engagements.

To determine if preengagement tactical performance can be used to predict subsequent performance under fire, the pooled scores (from Table 29) obtained by the squads during the movement-to-contact were correlated with the pooled scores during the engagement. The product-moment correlation between these two sets of process measures was 0.66 ($p < .001$) for pretraining and posttraining tests. Thus, a close correspondence can be shown between behavior during movement-to-contact and tactical performance during actual engagement. This finding helps to validate that the measures taken during the movement-to-contact phase are meaningful indicators of tactical proficiency.

The pooled scores for movement-to-contact were also correlated with the CEI. The product-moment correlation of these measures was 0.54 ($p < .01$)--surprisingly large, considering that performance during the movement-to-contact could have little direct influence on casualties inflicted and sustained. However, this correlation further strengthens the finding reported in the previous paragraph. It suggests also that the performance of units tends to be consistent: A unit that performs well during movement-to-contact is also likely to perform well during simulated engagements, and vice versa.

The identification of valid, objective measures of tactical effectiveness and the finding that squads are consistent in their performance have important implications for economy in training. The finding suggests that certain tactical skills are being measured which are reflected in the measures of observation, coordination, control, etc. used in this experiment. Further, these tactical skills are transferable; i.e., if learned in one situation they can be transferred and exhibited at another time and place. It is likely that only a limited number of tactical skills are required for effective execution of a variety of missions. Therefore, potentially the trainer can produce highly skilled, tactically proficient units without training on all missions, thus greatly improving economy of training. Before this economy can be achieved, however, the trainer

must be able to measure accurately the skills a unit possesses and determine what additional training it needs. This guidance can best be provided by improved ARTEPs that incorporate more objective and valid measures of effectiveness.

Implications

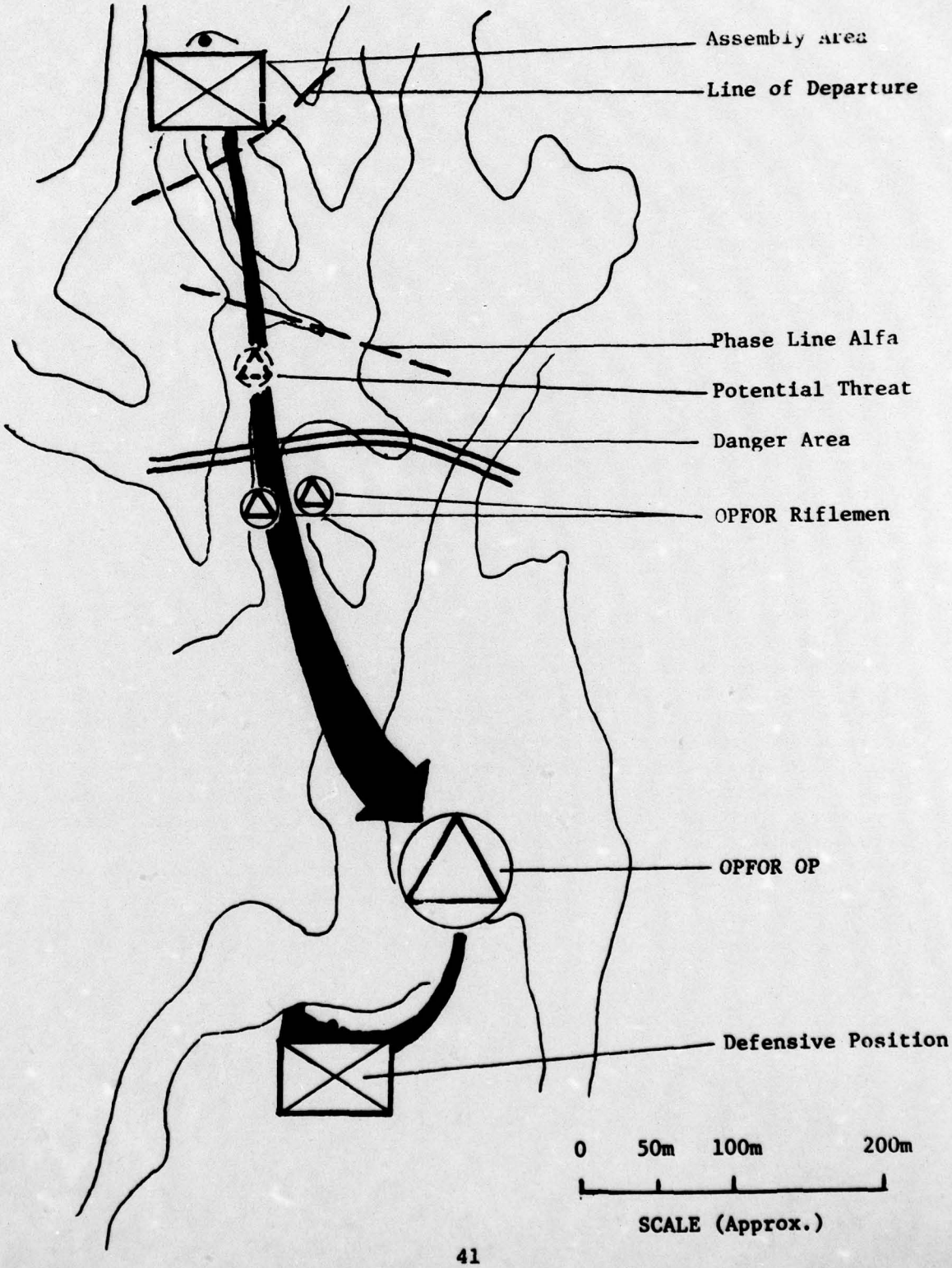
Current rifle squad ARTEPs focus the evaluation process most heavily on terminal products. They do not provide substantial guidance to trainers on critical squad performances during movement or during engagements themselves. Incorporation of new measures of engagement-related tactical performances is essential for the improvement of performance-oriented training and evaluation.

Product-oriented measures, such as casualties, are affected by a large number of factors in addition to the training status of a unit. These factors include mission and situation, weather, terrain, relative combat power, skill of the opposition force, and chance events. Consequently, such measures of performance are not, by themselves, reliable or valid indexes of the capabilities of a unit. (Given sufficient standardized replications, as in the present test, they can be useful for determining average tactical proficiency of a number of units.) Terminal product measures must be supplemented by measures of critical tactical processes in order to permit more adequate evaluation, accurate diagnoses of training deficiencies, and efficient conduct of remedial training.

Some of these critical tactical processes for rifle squads as well as possible measurement procedures are identified by the analyses presented in this and earlier reports. Others will be identified in subsequent papers. Moreover, the implications of this research for economy of training and for the training of larger units (e.g., platoon and company) are also significant, because most of the processes investigated are essential ingredients of sound tactical performance (e.g., overwatch, observation, coordination, and suppression) across a number of missions or echelons. Thus, the data and analyses presented here not only indicate the substantial training benefits to be derived from the use of REALTRAIN, but they also (perhaps more importantly) constitute a major step toward development of improved ARTEPs.

APPENDIX A

SKETCH MAP OF LANE 2 SHOWING LOCATIONS OF KEY SCENARIO EVENTS



APPENDIX B

ANALYSIS OF VARIANCE SUMMARY TABLES

Table B-1

Analysis of Variance for Total Pooled Measures of Performance During Movement

Source of variation	SS	df	MS	F	p<
A (Training group)	69.03	1	69.03	13.12	.005
B (Test)	81.28	1	81.28	16.45	.005
A x B	75.04	1	75.04	15.19	.005
Between cells	73.69	14	5.26		
Within cells	69.18	14	4.94		
Total	368.22	31			

Table B-2

Analysis of Variance for Pooled Measures of Mutual Support During Movement

Source of variation	SS	df	MS	F	p<
A (Training group)	12.5	1	12.50	7.44	.025
B (Test)	8.0	1	8.00	4.68	.05
A x B	8.0	1	8.00	4.68	.05
Between cells	23.5	14	1.68		
Within cells	24.0	14	1.71		
Total	76.0	31			

Table B-3

Analysis of Variance for Pooled Measures of Protection and Observation During Movement

Source of variation	SS	df	MS	F	p<
A (Training group)	13.78	1	13.78	6.89	.025
B (Test)	16.53	1	16.53	16.37	.005
A x B	13.78	1	13.78	13.65	.005
Between cells	27.94	14	2.00		
Within cells	14.19	14	1.01		
Total	86.22	31			

Table B-4

Analysis of Variance for Pooled Measures of Control and Communication During Movement

Source of variation	SS	df	MS	F	p<
A (Training group)	1.12	1	1.12	1.8	N.S.
B (Test)	4.50	1	4.50	7.9	.025
A x B	4.50	1	4.50	7.9	.025
Between cells	8.75	14	0.62		
Within cells	8.00	14	0.57		
Total	26.87	31			

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